Extraction Modification of Cellulose nanocrystals

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A B S T R A C T

Depending on the source, cellulose microfibrils produced during biosynthesis can range in size from 2 to 20 nanometers in diameter and up to several micrometers in length. Crystalline domains are scattered throughout each microfibril, which also contains amorphous and disordered regions. Chemical hydrolysis is used to break down amorphous chains and liberate crystalline domains from cellulose fibers in order to create cellulose nanocrystals. Sulfuric acid hydrolysis has been used more frequently for the synthesis of cellulose nanocrystals (CNCs) due to its excellent efficiency, as reported in the majority of studies. When sulfuric acid is used as the hydrolyzing agent, disordered or paracrystalline portions of cellulose fibers are preferentially hydrolyzed, while crystalline parts with a higher resistance to acid attack are left intact. It should be noted that sulfuric acid can react with the hydroxyl groups of cellulose during hydrolysis, producing charged sulfate esters on the surface of nanocrystals and facilitating the dispersion of nanoparticles in water . The modification of CNCs is intended to lower surface energy and increase the degree of dispersion by converting the polar hydroxyl groups on the surface of nanocrystals into moieties that can improve the interactions with non-polar polymers. The main challenge for surface modification of CNCs is to select a reagent and reaction medium that allow modification in a way that preserves the original morphology of nanocrystals while only changing the surface. The synthesis of glycosilicones from cellulose nanocrystals generally involves several reactions steps, and therefore catalysts. Capable of catalyzing the allylation reaction of cellulose to combine cellulose with allyl bromide and followed by a hydrosilylation reaction, catalyzed by Karstedt based on platine (0) to combine hydrophilic allylated cellulose and hydride-terminated hydrophobic silicone. The final polymers were characterized by FTIR, 1H NMR, and the solid-state SEM, the glycosilicones were insoluble in water, but swelled in organic solvents such as chloroform.

Keywords:

Cellulose nanocrystals CNCs. allylated cellulose. Hydrosilylation. Glycosilicone. Karstedt’s catalyst.